Samuel and Saing *BioMedical Engineering OnLine* 2013, **12**:118
http://www.biomedical-engineering-online.com/content/12/1/118

BioMedical Engineering OnLine

BOOK REVIEW Open Access

Review of "advanced materials for joint implants" edited by giuseppe pezzotti

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Book details

Pezzotti, G
Advanced Materials for Joint Implants.
Pan Stanford Publishing Pte. Ltd., Singapore: 2013;
604 pages. List price: USD 179.00, Print ISBN: 9789814316880. (Hardback)

Abstract

This article is a review of the book "Advanced Materials for Joint Implants" edited and written by Giuseppe Pezzotti. This book (hardcover) was published by Pan Stanford Publishing Pte Ltd. in 2013. The book discusses important trends and analytical tools used in the advancement of bioceramics and polyethylene used in joint implants.

Keywords: Biomaterials, Joint implants, Polyethylene, Bioceramics, Alumina, Spectroscopic methods

"Advanced Materials for Joint Implants" was released in 2013 and is divided into eight chapters with over 1,000 references. The book was written and edited by Giuseppe Pezzotti, an accomplished scientist in his field. The list price of $179.95 is comparable with other books published on this subject. In addition, individual chapters may be purchased in electronic format through the publisher's website. This text is intended for orthopedic surgeons, engineers and researchers interested in bioceramics and biomedical polyethylene used in joint implants.

The number of total joint arthroplasty procedures for hips and knees performed each year in United States is projected to increase dramatically over the next two decades [1]. Increase in primary implantation would also mean an increase in the numbers of revision surgeries, as many of these implants only last up to a maximum of two decades [2]. There is an ever growing demand for better joint replacement biomaterials that are optimal for a younger, more active, obese, and longer lived patient population. A comprehensive approach that takes into account the nano and macroscale properties of biomaterials, better manufacturing, quality control and packaging, better patient selection, innovative surgical techniques, infection control, and a proactive effort by hospitals to screen the implants for potential defects before implantation is required to meet this demand. "Advanced Materials for Joint Implants" addresses many of these issues.

"Advanced Materials for Joint Implants" is an excellent resource for anyone interested in understanding how biomaterial properties at molecular scale can be linked to

macroscopic joint implant performance. This book provides a critical review of various generations of bioceramics (e.g. alumina and zirconia), cross-linked polyethylene and metal implants used in joint replacement. However, as the cover design suggests, this book primarily focuses on hip implants with a lesser emphasis on knee implants. The book provides a refresher on various tribiological analysis and non-destructive biomaterials characterization techniques such Raman and Infrared Spectroscopy. Throughout the book, there are many examples of tissue and implant retrieval analysis using various spectroscopic methods.

Three chapters are dedicated to bioceramics. In these chapters, the author provides interesting insights into the lowered bioinertness of alumina and details the use of zirconia as well as zirconia-alumina composites in joint implants. Pezzotti also explains the use of analytical tools to evaluate traditional *in vitro* implant test results that do not account for *in vivo* factors such as stress and corrosive nature of body fluids. A thorough discussion of ultra-high molecular weight polyethylene based implants is also outlined and provides an excellent explanation on how spectroscopic methods can be used to differentiate between creep and wear in polyethylene based implants. The book also contains a dedicated chapter on future trends in joint replacements. The author provides the reader with a concise review of the latest advances in joint replacement materials including vitamin E infused polyethylene, metal-ceramic hybrid components, novel surgical techniques as well as future biomaterial choices for joint implants. The author concluded the book by asserting that collaborative basic science research and a focus on prevention of joint diseases should be the way forward.

In summary, "Advanced Materials for Joint Implants" by Giuseppe Pezzotti is an excellent reference source for the dedicated materials scientist or orthopaedic surgeon who desires an up-to-date and in-depth text in the ever changing field of material science and joint implant surgery. However, the typical physician's interest in complex equations that emphasize advanced material science concepts will be the limiting factor for use in the medical community. Increased subheadings and a comprehensive index section would have accommodated the extensive use of advanced material science nomenclature in this book which the reader may find overwhelming. Biomaterials professors and students will benefit greatly by adding this book to their reference library.

Competing interests
The authors declare that they have no competing interests.

Authors' contribution
The authors contributed equally to the manuscript. Both authors read and approved the final manuscript.

Received: 5 November 2013 Accepted: 14 November 2013
Published: 16 November 2013

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doi:10.1186/1475-925X-12-118
Cite this article as: Samuel and Saing: **Review of "advanced materials for joint implants" edited by giuseppe pezzotti.** *BioMedical Engineering OnLine* 2013 **12**:118.